425

Journal of MOLECULAR BIOLOGY

EDITOR-IN-CHIEF
J. C. KENDREW

ASSISTANT EDITOR
S. BRENNER

EDITORIAL BOARD
G. Attardi
S. Bernhard
J. Cairns
G. N. Cohen
J. E. Darnell
G. von Ehrenstein
G. Felsenfeld
W. Gilbert
J. Hurwitz
A. D. Kaiser
A. Klug
G. E. Palade
D. C. Phillips
L. Stryer
C. Thomas
A. Tissières
J. Wyman

LIBRARY USE ONLY
UNIVERSITY OF HAWAII LIBRARY

H301
J73

VOLUME 52
28 August 1970 to 28 September 1970

ACADEMIC PRESS
LONDON and NEW YORK

Copyright © 1970, by Academic Press Inc. (London) Ltd.

ALL RIGHTS RESERVED

No part of this volume may be reproduced in any form, by photostat, microfilm, or any other means, without written permission from the publishers.

Printed in Great Britain

CONTENTS OF VOLUME 52

NUMBER 1, 28 AUGUST 1970

IUPAC–IUB Commission on Biochemical Nomenclature. Abbreviations and Symbols for the Description of the Conformation of Polypeptide Chains 1

MAY, M. S. and HOLLEY, R. W., Alanine Acceptance and Transfer by Nitrous Acid-modified Yeast Alanine Transfer Ribonucleic Acid . . . 19

IWATSUKI, N. and OKAZAKI, R., Mechanism of DNA Chain Growth. V. Effect of Chloramphenicol on the Formation of T4 Nascent Short DNA Chains . 37

BELITSINA, N. V. and SPIRIN, A. S., Studies on the Structure of Ribosomes. IV. Participation of Aminoacyl-transfer RNA and Peptidyl-transfer RNA in the Association of Ribosomal Subparticles 45

SAMUELS, H. H. and TOMKINS, G. M., Relation of Steroid Structure to Enzyme Induction in Hepatoma Tissue Culture Cells 57

SHAPIRO, B. M., SICCARDI, A. G., HIROTO, Y. and JACOB, F., On the Process of Cellular Division in *Escherichia coli*. II. Membrane Protein Alterations Associated with Mutations Affecting the Initiation of DNA Synthesis . 75

MUSHYNSKI, W. E. and SPENCER, J. H., Nucleotide Clusters in Deoxyribonucleic Acids. V. The Pyrimidine Oligonucleotides of Strands *r* and *l* of Bacteriophage T7 DNA 91

MUSHYNSKI, W. E. and SPENCER, J. H., Nucleotide Clusters in Deoxyribonucleic Acids. VI. The Pyrimidine Oligonucleotides of Strands *r* and *l* of Bacteriophage Lambda DNA 107

LETTERS TO THE EDITOR—

WILLIAMS, R. C. and FISHER, H. W., Electron Microscopy of Tobacco Mosaic Virus under Conditions of Minimal Beam Exposure . . 121

SHIH, T. Y. and FASMAN, G. D., Conformation of Deoxyribonucleic Acid in Chromatin: A Circular Dichroism Study 125

SARABHAI, A. and LAMFROM, H., Initiation of the Polypeptide Chain in the *rII* B Cistron of Bacteriophage T4 131

VERMA, I. M., EDELMAN, M., HERZBERG, M. and LITTAUER, U. Z., Size Determination of Mitochondrial Ribosomal RNA from *Aspergillus nidulans* by Electron Microscopy 137

Erratum. 141

NUMBER 2, 14 SEPTEMBER 1970

KOGOMA, T. and LARK, K. G., DNA Replication in *Escherichia coli*: Replication in Absence of Protein Synthesis after Replication Inhibition . . . 143

BRUTON, C. J. and HARTLEY, B. S., Chemical Studies on Methionyl-tRNA Synthetase from *Escherichia coli* 165

KAN, J., NIRENBERG, M. W. and SUEOKA, N., Coding Specificity of *Escherichia coli* Leucine Transfer Ribonucleic Acids and Effect of Bacteriophage T2 Infection 179

GALLO, R. C. and PESTKA, S., Transfer RNA Species in Normal and Leukemic Human Lymphoblasts 195

VÁSQUEZ, C., BARRANTES, F. J., LA TORRE, J. L. and DE ROBERTIS, E., Electron Microscopy of Proteolipid Macromolecules from Cerebral Cortex . 221

DARBY, G., DUMAS, L. B. and SINSHEIMER, R. L., The Structure of the DNA of Bacteriophage ϕX174. VI. Pyrimidine Sequences in the Complementary Strand of the Replicative Form 227

OLSEN, B. R., SVENNEBY, G., KVAMME, E., TVEIT, B. and ESKELAND, T., Formation and Ultrastructure of Enzymically Active Polymers of Pig Renal Glutaminase 239

MORRIS, V. L., WAGNER, E. K. and ROIZMAN, B., RNA Synthesis in Cells Infected with Herpes Simplex Virus. III. Absence of Virus-specified Arginyl- and Seryl-tRNA in Infected HEp-2 Cells 247

GINSBERG, B. and HURWITZ, J., Unbiased Synthesis of Pulse-labeled DNA Fragments of Bacteriophage λ and T4 265

PETTIJOHN, D. E., CLARKSON, K., KOSSMAN, C. R. and STONINGTON, O. G., Synthesis of Ribosomal RNA on a Protein–DNA Complex isolated from Bacteria: A Comparison of Ribosomal RNA Synthesis *in vitro* and *in vivo* 281

FUCHS, E. and HANAWALT, P., Isolation and Characterization of the DNA Replication Complex from *Escherichia coli* 301

GOLDRING, E. S., GROSSMAN, L. I., KRUPNICK, D., CRYER, D. R. and MARMUR, J., The Petite Mutation in Yeast. Loss of Mitochondrial Deoxyribonucleic Acid during Induction of Petites with Ethidium Bromide . . . 323

LARK, C. and ARBER, W., Host Specificity of DNA Produced by *Escherichia coli*. XIII. Breakdown of Cellular DNA upon Growth in Ethionine of Strains with r_{15}^+, $r_{P_1}^+$ or r_{N3}^+ Restriction Phenotypes 337

HUBER, R., EPP, O. and FORMANEK, H., Structures of Deoxy- and Carbonmonoxy-erythrocruorin 349

DEROSIER, D. J. and MOORE, P. B., Reconstruction of Three-dimensional Images from Electron Micrographs of Structures with Helical Symmetry . . 355

WORCEL, A., Induction of Chromosome Re-initiations in a Thermosensitive DNA Mutant of *Escherichia coli* 371

LETTERS TO THE EDITOR—

ERIKSON, E. and ERIKSON, R. L., Isolation of Amino Acid Acceptor RNA from Purified Avian Myeloblastosis Virus 387

BARMAN, T. E., Reactivities of the Tryptophan Residues of α-Lactalbumin and Lysozyme to 2-Hydroxy-5-nitrobenzyl Bromide . . . 391

FUKE, M. and THOMAS, C. A., JR., Isolation of Open-circular DNA Molecules by Retention in Agar Gels 395

NUMBER 3, 28 SEPTEMBER 1970

LLINÁS, M., KLEIN, M. P. and NEILANDS, J. B., Solution Conformation of Ferrichrome, a Microbial Iron Transport Cyclohexapeptide, as Deduced by High Resolution Proton Magnetic Resonance. 399

HUNEEUS, F. C. and DAVISON, P. F., Fibrillar Proteins from Squid Axons. I. Neurofilament Protein. 415

DAVISON, P. F. and HUNEEUS, F. C., Fibrillar Proteins from Squid Axons. II. Microtubule Protein. 429

MORGAN, A. R., Studies on Polynucleotides. XCIV. Transcription of DNA's with Repeating Nucleotide Sequences. 441

CUNDLIFFE, E., Intracellular Distribution of Ribosomes and Polyribosomes in *Bacillus megaterium*. 467

YOSHIDA, A., Amino Acid Substitution (Histidine to Tyrosine) in a Glucose-6-Phosphate Dehydrogenase Variant (G6PD Hektoen) Associated with Overproduction. 483

RADDING, C. M., The Role of Exonuclease and β Protein of Bacteriophage λ in Genetic Recombination. I. Effects of *red* Mutants on Protein Structure. . 491

SHULMAN, M. J., HALLICK, L. M., ECHOLS, H. and SIGNER, E. R., Properties of Recombination-deficient Mutants of Bacteriophage Lambda. . . 501

Appendix— 516

TUNIS-SCHNEIDER, M. J. B. and MAESTRE, M. F., Circular Dichroism Spectra of Oriented and Unoriented Deoxyribonucleic Acid Films—A Preliminary Study. 521

Appendix— 538

MAESTRE, M. F., Circular Dichroism of DNA Films: Reversibility Studies. . 543

HILL, C. W., SQUIRES, C. and CARBON, J., Glycine Transfer RNA of *Escherichia coli*. I. Structural Genes for Two Glycine tRNA Species. 557

Carbon, J., Squires, C. and Hill, C. W., Glycine Transfer RNA of *Escherichia coli*. II. Impaired GGA-Recognition in Strains Containing a Genetically Altered Transfer RNA; Reversal by a Secondary Suppressor Mutation. 571

Letters to the Editor—

Millward, G. R. and Woods, E. F., Crystals of Tropomyosin from Various Sources. 585

Butler, P. J. G., Structures of Turnip Crinkle and Tomato Bushy Stunt Viruses. III. The Chemical Subunits: Molecular Weights and Number of Molecules per Particle. 589

Announcement 595

Index to Volume 52

Alanine acceptance and transfer by nitrous acid-modified yeast alanine tRNA, 19
Aminoacyl-transfer RNA and peptidyl-transfer RNA participation in the association of ribosomal subparticles, 45
Amino-acid acceptor RNA isolation from purified avian myeloblastosis virus, 387
Arber, W. (see also Lark, C.), 337
Arginyl- and seryl-tRNA, virus-specified, absence in herpes simplex-infected HEp-2 cells, 247
Aspergillus nidulans mitochondrial ribosomal RNA, size determination by electron microscopy, 137
Avian myeloblastosis virus, purified, isolation of amino-acid acceptor RNA, 387
Axon of squid, microtubule protein, 429
— — —, neurofilament protein, 415

Bacillus megaterium ribosomes and polyribosomes, intracellular distribution, 467
Bacteriophage λ and T4, unbiased synthesis of pulse-labeled DNA fragments, 265
— — DNA, pyrimidine oligonucleotides of strands *r* and *l*, 107
— —, effects of *red* mutants on protein structure, 491
— —, properties of recombination deficient mutants, 501
— φX174, pyrimidine sequences in the complementary strand of replicative form DNA, 227
— T2 infection, effect on coding specificity of *Escherichia coli* leucine tRNA, 179
— T4, initiation of the polypeptide chain in the rIIB cistron, 131
— — nascent short DNA chains, effect of chloramphenicol on formation, 37
— T7 DNA, pyrimidine oligonucleotides of strands *r* and *l*, 91
Barman, T. E., On the reactivities of the tryptophan residues of α-lactalbumin and lysozyme to 2-hydroxy-5-nitrobenzyl bromide, 391
Barrantes, F. J. (see also Vasquez, C.), 221
Belitsina, N. V. & Spirin, A. S., Studies on the structure of ribosomes. IV. Participation of aminoacyl-transfer RNA and peptidyl-transfer RNA in the association of ribosomal subparticles, 45
Bruton, C. J. & Hartley, B. S., Chemical studies on methionyl-tRNA synthetase from *Escherichia coli*, 165
Butler, P. J. G., The structures of turnip crinkle and tomato bushy stunt viruses, 589

Carbon, J., Squires, C. & Hill, C. W., Glycine transfer RNA of *Escherichia coli*. II. Impaired GGA-recognition in strains containing a genetically altered transfer RNA; reversal by a secondary suppressor mutation, 571
— (see also Hill, C. W.), 557
Carbonmonoxy- and deoxy-structures of erythrocruorin, 349
Cerebral cortex proteolipid macromolecules, electron microscopy, 221
Chloramphenicol effect on the formation of T4 nascent short DNA chains, 37
Chromatin DNA conformation studied by circular dichroism, 125
Circular dichroism of DNA films, reversibility studies, 543
— — spectra of orientated and unorientated DNA films, 521
— — study of the conformation of DNA in chromatin, 125
Clarkson, K. (see also Pettijohn, D. E.), 281
Cryer, D. R. (see also Goldring, E. S.), 323
Crystals of tropomyosin from various sources, 585
Cundliffe, E., Intracellular distribution of ribosomes and polyribosomes in *Bacillus megaterium*, 467
Cyclohexapeptide involved in iron transport, ferrichrome, deduction of solution conformation by high-resolution proton magnetic resonance, 339

Darby, G., Dumas, L. B. & Sinsheimer, R. L., The structure of the DNA of bacteriophage φX174. VI. Pyrimidine sequences in the complementary strand of the replicative form, 227

Davison, P. F. & Huneeus, F. C., Fibrillar proteins from squid axons II. Microtubule protein, 429
— (see also Huneeus, F. C.), 415
Deoxy- and carbonmonoxy- structures of erythrocruorin, 349
Deoxyribonucleic acid, breakdown of cellular DNA upon growth in ethionine of strains of *Escherichia coli* with r_{15}^+, r_{p1}^+ or r_{N3}^+ restriction phenotypes, 337
— —, circular dichroism of DNA films, reversibility studies, 543
— —, — — spectra of orientated and unorientated films, 521
— —, effect of chloramphenicol on the formation of T4 nascent short DNA chains, 37
— — in chromatin, conformation studied by circular dichroism, 125
— —, induction of chromosome reinitiations in a thermosensitive DNA mutant of *Escherichia coli*, 371
— —, isolation of open-circular molecules by retention in agar gells, 395
— — of bacteriophage λ pyrimidine oligonucleotides, 107
— — — — ϕX174, pyrimidine sequences in the complementary strand of the replicative form, 227
— — — — T7, pyrimidine oligonucleotides of strands *r* and *l*, 91
— — — *Escherichia coli*, membrane protein alterations associated with mutations affecting the initiation of synthesis, 75
— —protein complex isolated from bacteria, synthesis of ribosomal RNA, 281
— —, pulse-labelled fragment, unbiased synthesis in bacteriophage λ and T4, 265
— — replication complex from *Escherichia coli*, isolation and characterization, 301
— — — in *Escherichia coli* in absence of protein synthesis after replication inhibition, 123
— —, the petite mutation in yeast, loss of mitochondrial DNA during induction of petites with ethidium bromide, 323
— acids with repeating nucleotide sequences, transcription, 441
De Robertis, E. (see also Vasquez, C.), 221
DeRosier, D. J. & Moore, P. B., Reconstruction of three-dimensional images from electron micrographs of structures with helical symmetry, 355
Dumas, L. B. (see also Darby, G.), 227

Echols, H. (see also Shulman, M. J.), 501
Edelman, M. (see also Verma, I. M.), 137
Electron micrographs of structures with helical symmetry, reconstruction of three-dimensional images, 355
— microscopy of proteolipid macromolecules from cerebral cortex, 221
— — — tobacco mosaic virus under condition of minimal beam exposure, 121
Epp, O. (see also Huber, R.), 349
Erikson, E. & Erikson, R. L., Isolation of amino-acid acceptor RNA from purified avian myeloblastosis virus, 387
Erikson, R. L. (see also Erikson, E.), 387
Erythrocruorin, deoxy- and carbonmonoxy-structures, 249
Escherichia coli, breakdown of cellular DNA upon growth in ethionine of strains with r_{15}^+, r_{p1}^+ or r_{N3}^+ restriction phenotypes, 337
— —, chemical studies on methionyl-tRNA synthetase, 165
— —, coding specificity of leucine tRNA's and effect of bacteriophage T2 infection, 179
— —, DNA replication in the absence of protein synthesis after replication inhibition, 143
— — glycine tRNA, impaired GGA-recognition in strains containing a genetically altered tRNA, 571
— —, induction of chromosome reinitiations in a thermosensitive DNA mutant, 371
— —, isolation and characterization of the DNA replication complex, 301
— —, membrane protein alterations associated with mutations affecting the initiation of DNA synthesis, 75
— —, structural genes for two glycine tRNA species, 557
Eskeland, T. (see also Olsen, B. R.), 239
Ethionine, breakdown of cellular DNA upon growth in ethionine of strains of *Escherichia coli* with r_{15}^+, r_{p1}^+ or r_{N3}^+ restriction phenotypes, 337
Ethidium bromide, the petite mutation in yeast, loss of mitochondrial DNA during petite induction, 323
Exonuclease and β protein of bacteriophage λ, role in genetic recombination, 491

Fasman, G. D. (see also Shih, T. Y.), 125
Ferrichrome solution conformation as deduced by high-resolution proton magnetic resonance, 339
Fibrillar proteins from squid axons, 415
— — — — —, II, 429

Fisher, H. W. (see also Williams, R. C.), 121
Formanek, H. (see also Huber, R.), 349
Fuchs, E. & Hanawalt, P., Isolation and characterization of the DNA replication complex from *Escherichia coli*, 301
Fuke, M. & Thomas, C. A., Jr., Isolation of open-circular DNA molecules by retention in agar gels, 395

Gallo, R. G. & Pestka, S., Transfer RNA species in normal and leukemic human lymphoblasts, 195
Genetic recombination, role of exonuclease and β protein of bacteriophage λ, 491
Ginsburg, B. & Hurwitz, J., Unbiased synthesis of pulse-labeled DNA fragments of bacteriophage λ and T4, 265
Glutaminase, pig renal, formation and ultrastructure of enzymically active polymers, 239
Glucose-6-phosphate dehydrogenase variant (G6PD hektoen), amino acid substitution (histidine to tyrosine) associated with overproduction, 483
Glycine tRNA of *Escherichia coli*, impaired GGA-recognition in strains containing a genetically altered tRNA, 571
Goldring, E. S., Grossman, L. I., Krupnik, D., Cryer, D. R. & Marmur, J., The petite mutation in yeast loss of mitochondrial deoxyribonucleic acid during induction of petites with ethidium bromide, 323
Grossman, L. I. (see also Goldring, E. S.), 323

Halleck, L. M. (see also Shulman, M. J.), 501
Hanawalt, P. (see also Fuchs, E.), 301
Hartley, B. S. (see also Bruton, C. J.), 165
Helical symmetry, reconstruction of three-dimensional images from electron micrographs, 355
Hepatoma tissue culture cells, relation of steroid structure to enzyme induction, 57
Herpes simplex (see Virus)
Herzberg, M. (see also Verma, I. M.), 137
Hill, C. W., Squires, C. & Carbon, J., Glycine transfer RNA of *Escherichia coli*. I. Structural genes for two glycine tRNA species, 557
— (see also Carbon, J.), 571
Hirota, Y. (see also Shapiro, B. M.), 75
Holley, R. W. (see also May, M. S.), 19
Huber, R., Epp, O. & Formanek, H., Structures of deoxy- and carbonmonoxy erythrocruorin, 349
Human lymphoblasts, tRNA species in normal and leukemic cells, 195
Huneeus, F. C. & Davison, P. F., Fibrillar proteins from squid axons. I. Neurofilament protein, 415
— (see also Davison, P. F.(, 429
Hurwitz, J. (see also Ginsburg, B.), 265
2-Hydroxy-5-nitrobenzyl bromide, reactivity of the tryptophan residues of α-lactalbumin and lysozyme, 391

Initiation of the polypeptide chain in the rIIB cistron of bacteriophage T4, 131
Iron transport cyclohexapeptide of microbes named ferrichrome, solution conformation as deduced by high-resolution proton magnetic resonance, 339
Iwatsuki, N. & Okazaki, R., Mechanism of DNA chain growth V. Effect of chloramphenicol on the formation of T4 nascent short DNA chains, 37

Jacob, F. (see also Shapiro, B. M.), 75

Kan, J., Nirenberg, M. W. & Sueoka, N., Coding specificity of *Escherichia coli* leucine tRNA's and effect of bacterioohage T2 infection, 179
Klein, M. P. (see also Llinás, M.), 339
Kogoma, T. & Lark, K. G., DNA replication in *Escherichia coli*: replication in absence of protein synthesis after replication inhibition, 143
Kossman, C. R. (see also Pettijohn, D. E.), 281
Krupnik, D. (see also Goldring, E. S.), 323
Kvamme, E. (see also Olsen, B. R.), 239

T2 (see Bacteriophage)
T4 (see Bacteriophage)
T7 (see Bacteriophage)
Thomas, C. A. (see also Fuke, M.), 395
Three-dimensional image reconstruction from electron micrographs of structures with helical symmetry, 355
Tobacco mosaic virus, electron microscopy under conditions of minimal beam exposure, 121
Tomato bushy stunt and turnip crinkle virus structures, 589
Tomkins, G. M. (see also Samuels, H. H.), 57
Transcription of DNA's with repeating nucleotide sequences, 441
Transfer RNA, absence of virus-specified arginyl- and seryl-tRNA in herpes simplex-infected HEp-2 cells, 247
— —, alanine acceptance and transfer by nitrous acid-modified yeast alanine tRNA.
— —, chemical studies on methionyl-tRNA synthetase from *Escherichia coli*, 165
— — for glycine of *Escherichia coli*, impaired GGA-recognition in strains containing a genetically altered tRNA, 571
— — — glycine of *Escherichia coli*, structural genes for two species, 557
— — — leucine of *Escherichia coli*, coding specificity and effect of bacteriophage T2 infection, 179
— — species in normal and leukemic human lymphoblasts, 195
— RNA's, aminoacyl- and peptidyl-, participation in the association of ribosomal subparticles, 45
Tropomyosin crystals from various sources, 585
Tryptophan residues of α-lactalbumin and lysozyme, reactivity to 2-hydroxy-5-nitrobenzyl bromide, 391
Tunis-Schneider, M. J. B. & Maestre, M. F., Circular dichroism spectra of oriented and unoriented deoxyribonucleic acid films. A preliminary study, 521
Turnip crinkle and tomato bushy stunt virus structures, 589
Tveit, B. (see also Olsen, B. R.), 239

Vasquez, C., Barrantes, F. J., La Torre, J. L. & De Robertis, E., Electron microscopy of proteolipid macromolecules from cerebral cortex, 221
Verma, I. M., Edelman, M., Herzberg, M. & Littauer, U. Z., Size determination of mitochondrial ribosomal RNA from *Aspergillus nidulans* by electron microscopy, 137
Virus (see Tomato bushy stunt)
— (see Tobacco mosaic)
—, isolation of amino-acid acceptor RNA from purified avian myeloblastosis virus, 387
—-specified arginyl- and seryl-tRNA absence in herpes simplex-infected HEp-2 cells, 247

Wagner, E. K. (see also Morris, V. L.), 247
Williams, R. C. & Fisher, H. W., Electron microscopy of tobacco mosaic virus under conditions of minimal beam exposure, 121
Woods, E. F. (see also Millward, G. R.), 585
Worcel, A., Induction of chromosome reinitiations in a thermosensitive DNA mutant of *Escherichia coli*, 371

Yeast alanine tRNA, nitrous acid-modified, alanine acceptance and transfer, 19
—, petite mutation in loss of mitochondrial DNA during induction of petites with ethidium bromide, 323
Yoshida, A., An amino acid substitution (histidine to tyrosine) in a glucose-6-phosphate dehydrogenase variant (*G6PD* Hektoen) associated with over-production, 483